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GB 1468445
GB 1103022
GB 1020087
GB 773420
GB 721638
GB 696667
GB 697478
GB 677326
GB 672711
GB 426810
GB 409876
GB 381894
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(54) A Device for the Balancing of a Gate or Door

(57) A device for the balancing of a gate or door, for example a single-piece up-and-over door, comprises a helical tension spring (3), a first elongate member (9) having at least one aperture (4) therethrough to receive one end (2) of the helical tension spring, a second elongate member (10) mounted on the first elongate member so as to be displaceable relative thereto in the longitudinal direction of the elongate members and being fixed relative to the other end (6) of the helical spring (3), the helical spring surrounding the elongate members and a deformed region (18) being provided on at least one of the elongate members to enable said at least one elongate member to yield in the longitudinal direction thereof.

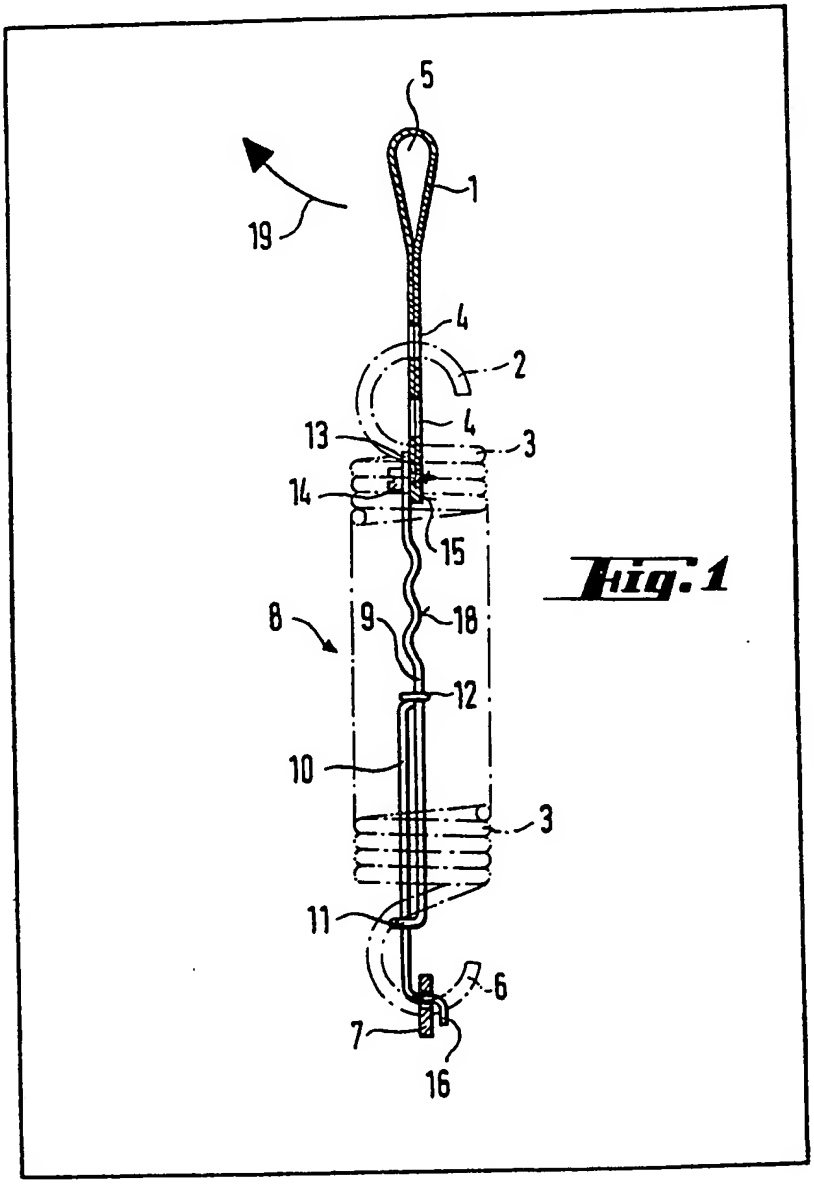

Fig. 1

The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.

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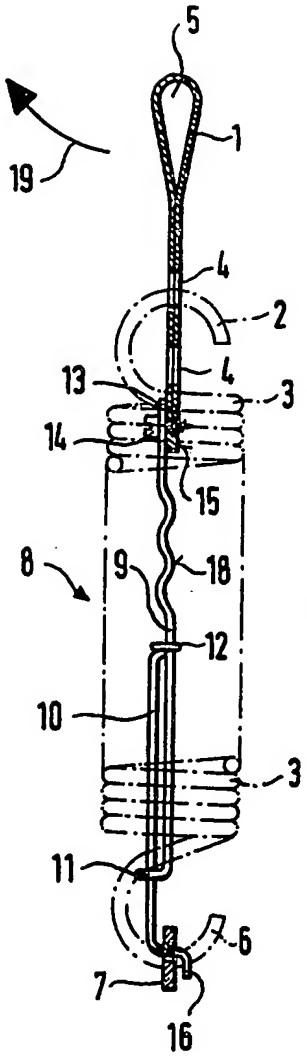

Fig. 1

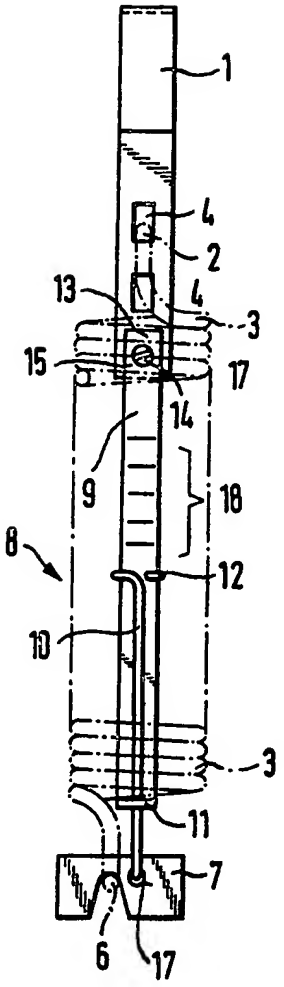

Fig. 2

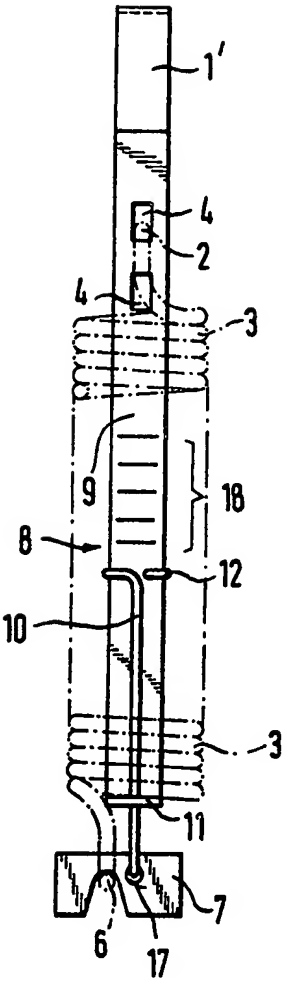

Fig. 3

SPECIFICATION

Device for the Balancing of a Gate or Door

The invention relates to a device for the balancing of a gate or door, for example a single piece up-and-over door, comprising a helical tension spring which acts between the frame and the gate or door. One or more such devices may be used to balance a door or gate.

The helical springs serve in a known way to balance the weight of the gate or door so that it can be moved, if possible, over the entire distance of movement between the closed and open positions with a small force requirement.

In the course of the movement of the gate or door between the open and closed positions, the helical springs are extended over a relatively small travel and are strongly prestressed. If such a tension spring breaks under its largest extension load, the two spring parts fly back onto their mountings with considerable energy due to the sudden release of the large force stored in the spring and move in an uncontrolled manner outside the normal spring excursion. A considerable danger of injury and damage results thereby. Such large deformations can occur on the gate or door construction that a repair merely by replacing the tensions spring and optionally its immediate holding parts is not possible. Rather, the load-bearing frame or supporting parts of the gate or door which are expensive to fit are also affected.

To enable a gate or door to be provided subsequently with sound-proofing or heat-insulating linings and/or decorative appendages and yet to be operated in as balanced a manner as possible, weaker additional springs have been provided which pass through the helical tension springs adjusted to the original weight of the gate or door and are arranged in their space surrounded by the turns of the outer spring. If the outer helical spring breaks, the inner additional helical spring, also, is loaded in an excessive way, as will be shown later, and this inner helical spring can no longer absorb the loads which occur and like-wise breaks.

The object of the invention is to provide a device of the above-mentioned type with which the dangers or possibilities of damage which a breaking spring can bring about both due to uncontrolled breaking out of the normal position and due to a violent impact on the anchoring points are at least largely reduced.

According to the invention, there is provided a device for the balancing of a gate or door, for example a single-piece up-and-over door, comprising a helical tension spring, a first elongate member having at least one aperture therethrough to receive one end of the helical tension spring, a second elongate member mounted on the first elongate member so as to be displaceable relative thereto in the longitudinal direction of the elongate members and being fixed relative to the other end of the helical spring, the helical spring surrounding the elongate members and a deformed region being provided on at least one of the elongate members to enable said at least one elongate member to yield in the longitudinal direction thereof.

By virtue of the provision of a structural element which passes through the spring and which consists of the first and second elongate members and whose variability of length corresponds within the scope of the longitudinal displacement guide at least to the extension travel which the spring covers upon the movement of the gate or door from the open position into the closed position, it is ensured, in the first place, that the spring parts, whose size depends on the break point, which are formed due to the breakage of the spring cannot fly out sideways in an uncontrolled manner since they are prevented from so doing by the structural element passing through them. The danger of damage of objects correspondingly within reach and especially the danger of injury of persons standing correspondingly near is consequently largely precluded.

Furthermore, the force with which the breaking spring loads its anchoring on the frame or the hinge carrying the gate or door is reduced or largely nullified due to the damping zone.

For this purpose, the following special feature is noteworthy: if the spring ends are held in their anchorings e.g. in such a way that they can neither move away laterally nor cause a spatial displacement of their anchoring, then the distance between the ends of the springs or the anchorings could never change over a travel which is above the maximum spring extension in normal operation. The structural element consisting of the first and second elongate members would therefore undergo no tensile load with the longitudinal displacement travel being utilised, so that the damping zone in the form of the yielding region of deformation would be subjected to no tensile load. However, a damping of the impact forces would not be possible therewith. In the case of a known spring suspension, however, the spring is suspended in a suspension opening of a band which is hinged, in turn, on the supporting joint arrangement of the gate or door. Due to this hingeing and to the band-shaped design, the band undergoes, upon the breaking of the spring, a force load which displaces it with respect to the spring suspension point, while turning it about its joint pivot point and deforming the band material, in such a way that the length between the spring suspension point on the band and the holding point on the frame side is now larger than the normal longitudinal extension of the spring. However the structural element is consequently exposed on the inside of the spring to a length-changing load which exceeds the displacement travel. At the end of the displacement travel the structural element therefore undergoes a tensile load with which the damping zone is extended with deformation of the band construction appropriately provided.

Since the longitudinal extension of the

deformed region requires energy, the force applies to the band is used up correspondingly. In the course of the upward pivoting movement of the band outside the spring suspension, energy whose magnitude can largely be determined due to the design of the deformation zone is consequently nullified due to this deformation work and additionally due to the bending of the band section outside the spring suspension. This prevents the breaking spring from acting upon the anchoring points, especially in the hinge region of the gate or door suspension, with such force that damage can occur on the supporting parts of the hinge construction and/or the frame.

The damping zone can be provided in a simple way preferably due to a wave-shaped, more or less strongly pronounced meander-shaped course or a zigzag-shaped portion of one of both of the elongate members. The size of the bulges of the elongage member out of its longitudinal course depends largely on the deformation resistance and the spring force to be absorbed.

To prevent the parts of the structural element which are guided longitudinally displaceably on one another, from striking against the insides of the turns of the helical springs under the normal loading of the spring between the opening and closing positions of the gate, the longitudinal guide is made with correspondingly little play, so that bends towards the spirals remain within the cavity of the spring. For this purpose, the procedure can be such that the end regions of the elongate members, adjacent one another, overlap one another and surround one another at least partly with small play with offsets provided at their ends.

In a preferred embodiment, the second elongage member, together with the lower end of the helical tension spring, is fixed to the gate or door frame and the damping zone is situated in the region of the band-shaped member in whose suspension opening or in one of the suspension openings of which is suspended the upper end, bent in the form of a hook, of the helical tension spring.

In principle, both elongate members can be made band-shaped. It is likewise conceivable to produce both elongate members from bar-shaped material, in which case it is necessary to ensure that the longitudinal displacement guide with little play ismaintained so that the structural element cannot strike against the turns of the helical tension spring. In a preferred embodiment, one elongate member is made of material having a circular cross-secion while the other elongate member is an independent part or a part made in one piece with a suspension band.

For the above-mentioned case of a double spring construction with a helical tension spring lying on the inside and a helical tension spring lying on the outside and guided around it, the device according to the invention can likewise be employed due to the fact that the structural element consisting of the parts guided longitudinally displaceably on one another leads through the inner space of the inner spring.

The invention is described in detail hereinafter with reference to exemplary embodiments illustrated in the drawing wherein:

Figures 1 and 2 are respectively a side view partly in section and a side view turned 90° thereto of an exemplary embodiment of the structural element with the anchoring points on the frame and supporting hinge construction of the gate or door as well as with a helical spring shown by broken lines only in respect of the end regions;

Figure 3 is a view corresponding to that of Figure 2 of a further exemplary embodiment in which a band having suspension openings and a band-shaped member of the structural element are made in one piece.

As can be seen from Figure 1, a holding part 1 which is adjacent the gate leaf hinge and which is designed as a band serves for the suspension of a hook-shaped end 2 of a helical tension spring 3, for which purpose several suspension openings 4 are arranged distributed in the longitudinal direction of the band, in order to enable the tensile stress of the helical tension spring to be varied. The holding part 1 forms in its end region remote from the spring a loop 5 with which it can be arranged in a hinged manner on a corresponding pin of the supporting joint arrangement for the gate or door. This pin of the joint arrangement serving as anchor point is selected so that upon the pivoting movement of the gate leaf it follows a path necessary for the balancing of the moving gate part and consequently the extension of the spring. The helical tension spring 3 is suspended with its lower hook-shaped end 6 in an anchor part 7 integral with the frame.

The inner space of the spring bounded by the turns of the spring surrounds a structural element, designated as a whole by 8, which consists in the case of the exemplary embodiment according to Figures 1 and 2 of an elongate band-shaped member 9 and an elongate member 10 formed from bar material. The members 9 and 10 are guided longitudinally displaceably on one another due to the respective enclosing of one member by the other. For this purpose, the lower end of the band-shaped member 9 is bent perpendicularly to the remainder of the member and is provided with a bore through which the bar-shaped member 10 is guided. The upper end of the bar-shaped member 10 is bent around the band-shaped member 9, so that an eyelet 12 enclosing the band-shaped member is formed. The bore in the bent section 11 of the band-shaped member 9 and the eyelet 12 are dimensioned so that they surround the respectively gripped other member with little play. In this way, a simple possibility is afforded of designing the longitudinal displacement guide in such a way that the structural element or its parts cannot be bent in such a way that the structural element strikes in a noise-generating manner against the turns of the helical spring.

In the case of the exemplary embodiment according to Figures 1 and 2, the upper end 13 of the band-shaped member 9 is connected, here by a screw connection 14, to the lower end 15, placed underneath the engaging opening with the hook-shaped end 2 of the spring 3, of the holding member 1. The lower end 16 of the bar-shaped member 10 is suspended in a bore 17 of the same anchor part of the frame 7 on which also the lower end 6 of the helical tension spring 3 engages. Due to the screw connection 14 between the band-shaped holding member 1 and the band-shaped member 9 of the structural element 8 it is possible to provide an already existing spring arrangement subsequently with the structural element and consequently to modify existing gates or doors accordingly. As shown in Figure 3, the holding member and the band-shaped member can be formed from a band-shaped sheet section, due to which there results a simpler production for gates which are provided immediately with the structural elements. In this case, therefore, the holding member comprises a loop-shaped end section 1' of the band-shaped member 9.

Above the longitudinal displacement travel, limited by the eyelet 12 and the bent end 11 in the state of rest or with minimum spring extension in the operating state, of the structural element 8 there is provided in the upper region of the band-shaped member 9 a damping zone in the form of a region of deformation 18 which is formed in the present case by a number of wave-shaped bulges succeeding one another in the longitudinal direction of the band and directed transversely to the wide side of the band. Instead of the wave shape, a zigzag shape or a trapezoidal form of construction can also be used. In any case, this region of deformation is intended, with a corresponding expenditure of force in the longitudinal direction of the band, to permit a change of length of the band due to a flattening of the bulges. This is effected with a corresponding expenditure of force which is dependent on the band material and the selected form of construction. The latter depends, in turn, on the energy to be nullified due to the breaking spring as well as on the available length change travel which upon the breaking of the spring exceeds its longitudinal extension under maximum load in the operating state.

With reference to Figure 1 it is suggested by an arrow 19 that upon the breaking of the spring 3 the holding part is pivoted about its loop centre 5, due to which there results a travel beyond the maximum spacing between the opening 4 receiving the hook-shaped end 2 of the spring 3 and the suspension point 17.

In the Figures the most important parts and sections are reproduced to scale, but other length ratios can arise without modification. In any case, the extent of the longitudinal displacement possibility of the two elongate members 9 and 10 of the structural element 8 must be selected at least large enough to ensure that it is just or not completely used up upon a maximum spring extension in normal operation. It must be remembered that the stability of the longitudinal displacement guide is preserved due to the bending of the two parts of the structural element. If, therefore, the longitudinal displacement travel is selected rather larger than is necessary for the longest extension in normal operation, then the desired function of the damping zone is, nevertheless, guaranteed, since the breaking spring breaks out sideways and thereby seeks to attain a larger length of the structural element. In any case, the members of the structural element thus come to the end of the displacement travel due to an impact between the eyelet and the bent end, whereupon a further extension load leads to the desired deformation of the damping zone.

Claims

1. Device for the balancing of a gate or door, for example a single-piece up-and-over door, comprising a helical tension spring, a first elongate member having at least one aperture therethrough to receive one end of the helical tension spring, a second elongate member mounted on the first elongate member so as to be displaceable relative thereto in the longitudinal direction of the elongate members and being fixed relative to the other end of the helical spring, the helical spring surrounding the elongate members and a deformed region being provided on at least one of the elongate members to enable said at least one elongate member to yield in the longitudinal direction thereof.

2. Device according to the claim 1, wherein said deformed region comprises a wave-shaped, zigzag-shaped and/or meander-shaped portion of one of or both the elongate members.

3. Device according to claim 1 or 2, wherein the end regions of each of the elongate members surround the other elongate member, whereby both elongate members remain with their longitudinal axes in the longitudinal direction of the spring.

4. Device according to any preceding claim, wherein the first elongate member is in the form of a band and the second elongate member is in the form of a bar.

5. Device according to claim 4, when appendant to claim 3, wherein the end region of the bar passes around the band, and the end region of the band extends substantially perpendicularly to the longitudinal direction of the band and has an aperture therein through which the bar passes.

6. Device according to any preceding claim, wherein the first elongate member comprises two portions connected by means of a screw, one of said portions being provided with means for anchoring the device to a pin.

7. Device according to any of claims 1 to 5, wherein the first elongate member is made in one piece and comprises means for anchoring the device to a pin.

8. Device according to any preceding claim, wherein said helical tension spring is surrounded by a second helical tension spring.

9. A device according to any preceding claim, in combination with a gate or door, said other end of the helical spring and said second elongate member being secured to the frame of the gate or door.

10. A device for the balancing of a gate or door, substantially as herein described with reference to the drawing.

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